

FeedBack

Clarification Regarding 2009 Manual

I found the article “Why a Federal Surveying Manual is Relevant to the States,” by Steve Hansen intriguing [Sept. 2009]. I interpret the author to mean that the new manual soon to be published (2009) is binding on all recovery, restoration, and retracements of the Public Land Survey regardless of the date of the original establishment. If this is the author’s intent, then I would disagree. If I misunderstood the author’s intent, then the following might be moot.

In actuality the *Manual* is only binding on Public Domain (PD) and Tribal Lands, as the BLM has the authority to do whatever they please on these lands. Once land is patented or transferred out of federal ownership, a new set of rules applies. Surveys of patented or transferred land fall under the state purview, so the required use of the *Manual* only occurs by incorporation in rules, laws, and through published court cases.

Minnesota Statutes Chapter 389.04 “Rules for Surveys” states, “... *In subdividing townships, sections, or parts of sections, as established by the United States survey thereof, and in restoring lost or obliterated government corners, the county surveyor shall follow the rules established by or pursuant to acts of Congress, and all such surveys shall be made in strict conformity to the original survey made by the United States.*”

This statute applies to the County Surveyor but, in actuality, Minnesota surveyors generally abide by this rule. The key phrase however is “... *surveys shall be made in strict conformity to the original survey made by the United States.*” This statement clearly indicates that the rules to be followed must be those in effect at the time of the original survey—for example, restoring Public Land Survey corners originally established by the BLM in 1955. This action would require the use of the *1947 Manual* and any special instructions provided by the Surveyor General to the Deputy Surveyor and the accepted township plat. The restoration pamphlet in circulation at the time would only serve as a guideline to interpret the manual.

As a land surveyor in Minnesota I can survey patented lands up against PD

and Tribal Lands, but my surveys are only valid for the patented lands. These surveys have no status against the PD or Tribal Lands unless I am operating under special instruction from the BLM prior to the survey or my survey is subsequently accepted by the BLM.

*Respectfully submitted,
Ken Whitehorn
Via the Internet*

Hansen Replies

If I gave the impression that it is my belief that the 2009 edition of the *Manual of Surveying Instructions* is binding on all recovery, restoration, and retracements of the Public Land Survey System (PLSS) regardless of the date of the original establishment, then my article gave the wrong impression. I agree with Mr. Whitehorn that State licensed land surveyors need to perform the necessary research within their own jurisdictions to determine whether the *Manual* has been incorporated in rules, laws, and through published court cases.

Some states have incorporated the *Manual*, or portions of it, through appropriate authorities. In certain situations it could be binding within that jurisdiction. For instance, the *Manual* might be cited in a State’s statute laws, administrative laws, attorney general opinions, and State court cases. These competent jurisdictions are what bind the practice of land surveying in Minnesota, not the *Manual*. Whatever authority the *Manual* has or does not have in any particular state needs to be determined by investigating the state laws and regulations and then applying the controlling principle to the specific case at hand.

The Minnesota Supreme Court has summed up the relationship of Federal surveying rules and the practice of surveying private land in *Chan v. Brandt*, 45 Minn. 93 (1890):

The monuments and boundary lines as established by the United States government survey control the description of lands patented by the United States.

Mistakes in the surveys cannot be corrected by the judicial department of the government.

State statutes are inoperative when it comes in conflict with the rules established by acts of congress for subdividing sections.

The rights of parties who purchase according to the government survey cannot be affected by an act of the legislature.

Mr. Whitehorn correctly interprets the limits of Federal authority. *U.S. v. Reimann*, 504 F.2d 135, 1974 states:

Prior to title passing from the United States, it is undisputed that the Government has the power to survey and resurvey, establish and reestablish boundaries on its own lands.

Once patent has issued, the rights of patentees are fixed and the government has no power to interfere with these rights, as by a corrective resurvey.

The government is bound by the last official survey accepted prior to its divestment of title.

There is a separation between state and federal land surveying and boundary laws. The ownership and jurisdiction of the lands normally determine which law controls. The various states regulate the practice of land surveying within their boundaries, while federal authority surveyors operate under U.S. statutes, regulations, case precedent and the *Manual*. There are situations where the *Manual* is relevant to the private surveyor, and situations where it is not.—*S.H.*

Harping on Corrections

Shawn Billings’ review of the Altus APS-3 in the last issue is a very good article. I have a technical suggestion regarding localization. He states that he established control previous to the tests by conventional total station and performed a least-squares adjustment on the results. He also states that since he set the base on a known point, he didn’t need to perform a localization. I would maintain that this is exactly a situation in which he *would* want to perform a localization. Although the differences obtained here may not have been significant for standard use, it is especially important to localize for purposes of testing the GPS. For this

test, I would have localized using three horizontal control points (including the base) and one vertical control point with a geoid model. I would have used the remaining points as the check points to gather statistics.

The reason this is true is that there generally will be orientation and scale differences between a conventional survey and a GPS survey. (Depending on how Carlson implemented the localization, scale may be more or less important—if they implemented it the way we did at TDS, and if you were at any significant elevation above sea level. For example, if you were 1,000 feet above the ellipsoid, the scale difference would amount to about 0.14 feet on a 3,000-foot baseline.)

I keep harping on this on one of the online bulletin boards, but the RTK base does not transmit *corrections*; instead, it transmits its *raw carrier data* to the rover. I know that some vendors use the term “corrections”, but that is either because their English is not so good or because it serves as convenient shorthand.

(The rover may transmit corrections in addition to the raw data, but it is the raw data that is used by the rover to compute the baseline. There is research into performing RTK in correction-mode because this mode requires at least an order of magnitude less bandwidth in the radio link, but I don’t believe that the precision is quite up to RTK levels.)

I should also state that VRS-type RTNs do use corrections, but these are refinements applied to the normal RTK solution.

*Jay Goldfarb
Via the Internet*

Billings Replies

I appreciate your comments, Jay, and having read your comments on the bulletin board for quite a while now, recognize your experience and knowledge regarding GPS methodology. Regarding the localization, I’m afraid you pointed out a weakness in my ability to clearly communicate the test area. The control segment was based on a conventional survey mixed with GPS static surveying. The least squares adjustment (from Columbus) reported actual State Plane coordinates. So, my thoughts were that setting the base up on a point with low residuals (or better a fully constrained point) from the adjustment would work fine without a localization. I then collected points with

the Altus and compared the collected coordinate values as projected on SPC to the control point coordinate values as projected on SPC.

As to the use of the term “corrections” I agree. I have a few pet peeves like that myself, and while I could no more write the code that processes GPS data than I could build my own Buick, I do understand that the data being sent are the direct observations

from the base unit of the phase data from the satellites, and that the RTK rover is what is doing all of the heavy lifting. I will make an effort to be a little more precise in the future on how I communicate that.

I do appreciate you taking the time to read the article and I particularly appreciate you taking the time to write and comment. Feel free to do so in the future (pro or con).—S.B.

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Taking a Peak at the Datum

One sentence in particular caught my eye in "Measuring Granite Peak" in the August issue. Barron Parks (a cool name, by the way, for a Rocky Mountain surveyor) and his Billings, Montana survey crew, not to mention Selby's and Angry Hank's Brewery as their sponsors, should be commended for their efforts in validating the published height of Granite Peak using precise GPS surveying methods. We

should be thankful to the folks at NGS as well, for providing American surveyors with OPUS as a convenient tool to access both CORS data and the processing software for achieving millimeter accuracies in geodetic positioning.

I took exception to Parks' wording however, when he proffered Curtis Smith's notion that:

"...gravity really plays with GPS, especially in mountainous terrain." In all

fairness to gravity it would be more fitting and proper to turn that statement around. It would be more accurate to say that GPS is the one really playing with gravity.

Gravity is what defines the coordinate origin of WGS 84, which is fixed at the earth's center of mass, and gravity, of course, is also what keeps our GPS satellites in their predictable orbits. In addition, variations in potential of the earth's gravitational field cause the satellite clocks in outer space to tick just a little bit faster than do our control clocks down here on the ground. But other than that, gravity does not play with GPS nor does gravity in any way affect the computation of earth-centered earth-fixed GPS coordinates.

GPS, on the other hand, *does* play with gravity in the sense that any GPS elevation reading is only as good as the datum to which it is referenced. To secure a true and accurate elevation of Granite Peak, or any other mountain peak for that matter, it is necessary to accurately reference the localized equipotential surface of the geoid as the datum. To complete that mensural task a dual-frequency GPS receiver is of little use. A level is what you need.

So, while the Billings crew has indeed validated 12,807 feet as the true elevation of the peak based on NAVD 88, the fact remains that there exists a local six-foot difference between that datum and the previous NGVD 29, which still leaves open the question of how accurately the new datum conforms to the geoid at Granite Peak, which, of course, also leaves in some doubt the true and accurate elevation of the peak. The only practical way to empirically verify the published height would be to run a few level-loops up to the peak and back. To anyone like me, who has yet to climb Granite Peak, that might sound like a simple enough task to accomplish, but are there any takers?

*Douglas Critchfield, LS
Via the Internet*

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